Kehang Zhu

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EDUCATION

Ph.D., Harvard University *Sept. 2021 – Present*
- Physics
- Secondary field in Computer science and engineering

M.S., Harvard University *Sept. 2021 – May 2024*
- Computer Science

B.A., University of Science and Technology of China (USTC) *Sept. 2017 – July 2021*
- Physics

AWARDS & HONORS

◇ *2024 Introduction to Technical AI Safety Fellowship, Harvard*
◇ *2024 APS March Meeting selected press coverage*
◇ *2023 Sky9 Innovation Fellowship*
◇ *2021 Purcell Fellowship, Harvard*
◇ *2020 Guo Moruo Scholarship (Highest honor for USTC undergrad students)*
◇ *2020 Yan Jici Scholarship (Highest honor for Physics department undergrad students)*
◇ *2019&2018 National Scholarship (top 1%)*

WORKING PAPER

- Manning, Benjamin S*., **Kehang Zhu***, and John J. Horton. "Automated Social Science: Language Models as Scientist and Subjects." arXiv preprint arXiv:2404.11794 (2024).
- Bae, Henry, Aghyad Deeb, Alex Fleury, and **Kehang Zhu***. "ComplexityNet: Increasing LLM Inference Efficiency by Learning Task Complexity." arXiv preprint arXiv:2312.11511 (2023).

PUBLICATION

- **Kehang Zhu***, Benjamin Manning*, John Horton. Silica Scientist: A Tool for Automated Causal Hypothesis Generation and Simulated Experimental Validation (2023 CODE)
- Carolina Nobre*, **Kehang Zhu***, Eric Morth, Hanspeter Pfister, Johanna Beyer. Reading Between the Pixels: Investigating the Conceptual Hurdles to Visualization Literacy (2024 CHI)
- **Kehang Zhu,** Zhiping Yang et.al., Experimental sensing of a quantum atmosphere of a single spin, Quantum Frontier Volumn3, Article 1 (2020)

CONFERENCE PRESENTATIONS

- NBER SI 2024 Digital Economics and Artificial Intelligence workshop, Paper Presentation — July 2024
- International Conference on Computational Social Science (IC2S2), UPenn, Oral — July 2024
- ACM Collective Intelligence, Boston, Oral — June 2024
- AI, Cognition, and the Economy (AICE) 2024 Workshop, Microsoft Research — May 2024
- AI and the Future of Work Conference ,Wharton, Paper Presentation (co-author) — May 2024
- MeasureDev2024, World Bank, Paper Presentation — May 2024
- Econometric Society Interdisciplinary Frontiers conference on Economics and AI+ML — May 2024
- 2024 American Causal Inference Conference (ACIC), poster presentation — May 2024
- ACM Computer-Human Interaction (CHI), Paper Presentation (co-author) — May 2024
- APS March Meeting, American Physical Society, Focused Talk — Mar 2024
- Interactive Causal Learning Conference, Florida Atlantic University, Paper Presentation (co-author) — Dec 2023
- Conference On Digital Experimentation (CODE), MIT, Paper Presentation (co-author) — Nov 2023
- APS March Meeting, American Physical Society, Focused Talk — Mar 2022

INVITED TALKS

- International Conference of the French Association of Experimental Economics (ASFEE), Grenoble — Aug 2024
- Data Science Summit 2024, DataFun, Online — May 2024
- AI Institute for Artificial Intelligence and Fundamental Interactions, MIT — Feb 2024
- Human-computer Interaction group, Harvard — Nov 2023

RESEARCH

2024.2 – Now ***Towards Human-like Large language models*** MA, USA
Supervisor: Prof. John Horton (MIT Sloan School of Management) & Prof. David Parkes (Harvard EconCS)
- Benchmark LLM behaviors with Human subject data
- Mechanism design with LLM-agents

2023.5 – Now ***Large language models As Scientist and subjects*** MA, USA
Supervisor: Prof. John Horton (MIT Sloan School of Management)
- Developed an end-to-end automatic pipeline that encompasses causal hypothesis generation, experimental design, simulation execution, econometric data collection, and hypothesis validation utilizing large language models (LLMs).
- Designed an algorithm for instantiating LLMs as human agents and their interaction
- Provided a sandbox to simulate and analyze various social scenarios – from wage bargaining to auction mechanics with the flexibility to vary agent properties across a nearly infinite parameter space

2023.3 – 2023.8 ***Human-computer Interaction and Visualization*** MA, USA
Supervisor: Prof. Hanspeter Pfister (Harvard CS)
& Prof. Carolina Nobre (CS department, University of Toronto)
- Employed 300 Qualtrics workers for an empirical study that investigates the rationale behind mistakes in the visualization literacy assessment test.
- Applied eye-tracking technology to track the user's gaze when taking the visualization literacy assessment test.
- Proposed a mental model for conceptual barriers in interpreting data visualizations

2022.5 – 2023.5 ***Graph Neural Network For Material Modeling*** MA, USA
Supervisor: Prof. Boris Kozinsky (Harvard SEAS)
- Used Equivariant graph neural network (GNN) and Gaussian Process (GP) regression to study the conductance of Solid state battery electrolyte Li3PO4.
- Applied Density Functional Theory(DFT) package like VASP and Quantum Expresso to perform ab-initio calculation on Li3PO4 to build up dataset for machine learning
- Developed a robust parallel computing algorithm to accelerate the computation.

2020.3 – 2022.5 **Theoretical Modeling of Quantum Material** MA, USA
Supervisor: Prof. Frank Wilczek (MIT Theoretical Physics Center)
- Developed Quantum Monte Carlo to carry out the simulation of the emergent photon and spinon behavior in quantum spin ice (QSI)
- Developed the quantum worm algorithm (WA) to study minimal model--XXZ model on the pyrochlore lattice
- Measured QSI's thermodynamics and added additional terms to tune the speed of light and emergent charge and see how physical observables change by tuning these parameters
- Developed Diffusive Monte Carlo Algorithm to simulate the non-equilibrium dynamics of dipolar spin ice (DSI)

TEACHING
- 2023-2024, Leading TA, Harvard Physics 262/ Applied Physics 284 – Statistical Mechanics
- 2023, Harvard Physics 1-A – Introduction to Physics

REVIEW
- ICML/ ACM CHI / Vis / Pacific Vis/ EuroVis
- International Conference on Computational Social Science (IC2S2) / ACM Collective Intelligence
- International Conference on Neural Information Processing (ICONIP)

SKILLS
- Analysis: Python/ R/ C++
- Full-stack: REACT/ Flask/ FastAPI/ MySQL/ SQLite/ Vector Database (Pinecone)
- Visualization: D3.JS, R
- Cloud computing: Azure, Google Cloud
- Machine learning: Pytorch,Tensorflow, JAX, NLP.
- User Study: Qualtrics

ACTIVITY INVOLVEMENT
Harvard GSAS Entrepreneurship Community, *a Harvard student organization aiming to promote innovation and Entrepreneurship among graduate students.* MA, USA
President *2021.12 – 2022.12*

Harvard GSAS Web3 Demo Day, *a Demo show for innovations on Web3 and Metaverse technologies.* MA, USA
Co-organizer *2022.11*